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# INK JET RECORDING DEVICE

## CLAIMS

[Claim(s)]

[Claim 1] An ink jet recording device which has a head recovery device which is characterized by providing the following, and which is connected to an arm head for ink jet record, and attracts ink from a head nozzle Said head recovery device is a cap which covers said head nozzle. A waste ink tank which accumulates waste ink A flexible tube which leads waste ink to said waste ink tank from said cap A control means which carries out adjustable control of the rotational speed of said motor means according to an angle-of-rotation location of said Rota based on a motor means to control rotation of rotation koro which moves while pressing a range which this tube appointed beforehand, Rota rotated while supporting this rotation koro, and said Rota, a zero sensor which detects a home position of rotation of said Rota, and an output of said sensor means

[Claim 2] An ink jet recording device according to claim 1 characterized by having prepared said cap, a tube, rotation koro, and a group of Rota to each of two or more arm heads, and making a phase on said Rota of two or more of said rotation koro into an inequality.

[Claim 3] An ink jet recording device according to claim 2 characterized by changing this phase with a phase of said rotation koro in Rota for arm heads of black ink while making in agreement a phase of two or more of said rotation koro for [ two or more ] arm heads other than black ink.

[Claim 4] An ink jet recording device according to claim 2 characterized by shifting mutually a phase of said rotation koro in each Rota of two or more arm heads at equal intervals mostly.

[Claim 5] An ink jet recording device according to claim 1, 2, 3, or 4 which performs recovery action after checking said home position by said zero sensor, just before performing recovery action using said head recovery device.

[Claim 6] An ink jet recording device according to claim 1, 2, 3, 4, or 5 characterized by differing from said motor rotational speed at the time of empty suction which performs rotational speed of said motor means at the time of ink suction at the time of empty suction

after ink suction, and/or printing termination.

[Claim 7] An ink jet recording device according to claim 2, 3, 4, 5, or 6 characterized by making rotational speed of said motor adjustable according to the number of arm heads which actually attract ink among arm heads in which two or more loading is possible.

[Claim 8] An ink jet recording device according to claim 1, 2, 3, 4, 5, 6, or 7 characterized by making rotational speed of said motor means adjustable according to a class of ink.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the ink jet recording device which breathes out ink to a record medium and forms an image, and relates to the configuration and actuation of the print head of a recovery system especially.

[0002]

[Description of the Prior Art] In an ink jet recording device, if it continues beyond predetermined time and printing is continued continuously, the printing condition of a print head may change and image grace may deteriorate.

[0003] A discharge condition is judged during printing or the ink of the specified quantity is made to breathe out from a print head in a print head recovery device with a predetermined time interval as this cure. Or the face side of the delivery of a print head is covered with the cap made of rubber etc., and the inside of a nozzle is cleaned by generating negative pressure from the exterior and attracting ink from a nozzle.

[0004]

[Problem(s) to be Solved by the Invention] As a means to generate negative pressure, the so-called tube pump type recovery system is known. This moves ink to a waste ink tank from the ink with which drew through the flexible tube connected to the cap which covers a head nozzle by the rotation koro, and the cap was covered, or the nozzle which contacted. A motor is usually used for the rotation drive of this pump. Since the rotation load of a pump changes according to whether there is any paddle with which the rotation koro is in contact with the tube, it is necessary to do selection and control of the power of a motor according to the greatest load.

[0005] Moreover, since a tube pump type recovery system is driven proper, a means to detect the zero of a recovery system is established. The zero detection activity of this recovery system is detecting, when a power up and all recovery are completed conventionally. However, since a motor will generate heat if the zero of a recovery system is excited and left in the condition of not operating a motor after detection termination, excitation must be cut. If a motor is excited again and cleaning actuation is performed when

the cleaning demand of a print head occurs, the excitation phase of a motor is put back with the load of a pump or a tube at the moment of cutting excitation of a motor, and it may stop by the intermediate phase. If it excites again in such the condition, the error for one step will occur. This error is accumulated until it performs zero detection of a recovery system again.

[0006] As mentioned above, since the load made to rotate a pump changes with locations, when it is made to drive after the above-mentioned error has occurred, it has a possibility that a motor may carry out step-out. Although the power of a motor needed to be greatly set up also from this semantics, there was a problem of inviting the increment in that part, cost, and an installation space.

[0007] Therefore, the purpose of this invention is to offer the ink jet recording device which can drive a more suitable tube pump type recovery system.

[0008] Moreover, other purposes of this invention are to offer the ink jet recording device which has the tube pump type recovery system of a new configuration of that the useless ink consumption by the recovery system can be prevented.

[0009]

[Means for Solving the Problem] An ink jet recording device by this invention is an ink jet recording device which has a head recovery device which is connected to an arm head for ink jet record, and attracts ink from a head nozzle. A cap said whose head recovery device covers said head nozzle, and a waste ink tank which accumulates waste ink, A flexible tube which leads waste ink to said waste ink tank from said cap, Rotation koro which moves while pressing a range which this tube appointed beforehand, and Rota rotated while supporting this rotation koro, It has a motor means to control rotation of said Rota, a zero sensor which detects a home position of rotation of said Rota, and a control means which carries out adjustable control of the rotational speed of said motor means according to an angle-of-rotation location of said Rota based on an output of said sensor means.

[0010] More specifically, rotational speed of a motor is relatively reduced within the limits of a heavy angle-of-rotation location of a load of Rota. It can be coped with thereby comparatively suitable for a load effect of Rota also by motor of small power.

[0011] In said ink jet recording device, said cap, a tube, rotation koro, and a group of Rota are prepared to each of two or more arm heads, and it is good also considering a phase on said Rota of two or more of said rotation koro as an inequality. By making inharmonious a phase on said Rota of two or more of said rotation koro, a load applied to a motor at once can be distributed.

[0012] For example, while making in agreement a phase of two or more of said rotation koro for [ two or more ] arm heads other than black ink, this phase can be changed with a phase of said rotation koro in Rota for arm heads of black ink. According to this, since suction actuation can be carried out separately independently to an arm head of black ink, and other arm heads, ink consumption by useless suction can be prevented.

[0013] Or a phase of said rotation koro in each Rota of two or more arm heads can be

shifted mostly at equal intervals mutually. Also in this case, suction actuation can be carried out per arm head according to individual.

[0014] In said ink jet recording device, just before performing recovery action using said head recovery device, after checking said home position by said zero sensor, it is desirable to perform recovery action. Even if a home position of a recovery system is changing by the enter end of excitation of a motor before that by checking a home position just before performing suction actuation, the suction point shifting, and poor suction occurring or carrying out step-out is lost.

[0015] The still more nearly following various deformation and modification are possible for this invention.

[0016] a different thing from said motor rotational speed at the time of empty suction which performs rotational speed of said motor means at the time of ink suction at the time of empty suction after ink suction, and/or printing termination -- things are made.

[0017] Or rotational speed of said motor can be made adjustable according to the number of arm heads which actually attract ink among arm heads in which two or more loading is possible.

[0018] Furthermore, rotational speed of said motor means can be made adjustable according to a class of ink.

[0019]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to details with reference to a drawing.

[0020] Drawing 1 is the outline block diagram of the ink jet recording device concerning the gestalt of operation of this invention.

[0021] In addition to the print head 2, a platen 11, the guide shaft 12, carriage 13, the head recovery system 14, the control unit 15, and the record form P are shown in drawing 1 . A platen 11 lays the record form P which is a recorded material in the upper surface. Drive conveyance is carried out by the conveyance roller 16 and the pinch roller (not shown), and the record form P moves by them in this platen 11 top while being recorded by the print head 2 on a platen 11. The guide shaft [ parallel to a platen 11 for example, ] 12 parallel to two each other is constructed above the platen 11. Carriage 13 is attached in the guide shaft 12 free [ both-way migration ] through the slide bearing (not shown), and it enables it to move carriage 13 to it in parallel along with the guide shaft 12. The print head 2 which carries out the regurgitation of the ink is carried in this carriage 13. With a motor and a belt (neither is illustrated), carriage 13 can operate according to control of a control unit 15, and can carry out both-way migration of the carried print head 2 in parallel with the guide shaft 12. The head recovery system 14 which performs ink suction actuation of a print head 2, wiper actuation, and reserve ****** is formed in the evacuation location outside the image formation field of the end of the movable range of carriage 13. Actuation of the head recovery system 14 is also controlled by the control unit 15.

[0022] Drawing 2 is the side elevation showing the outline configuration of the head recovery system 14. An arm head 2, cap 101, a pump 102, the tube 103, the waste ink tank 104, the recovery system zero sensor 105, and the recovery system zero flag 106 are shown in drawing 2 . The cap 101 is arranged at the crowning of the recovery system 14. The end of a tube 103 is connected to the lower limit of cap 101, and the other end of a tube 103 is led to the waste ink tank 104 via the pump 102. A pump 102 has Rota 107 which a center is fixed and can perform rotation actuation. To one place of the periphery in this Rota 107, the rotation koro 108 has projected to the method of outside by the spring force. In the example of drawing 2 , the tube 103 is twisted around the pump 102 a part gone half round. If Rota 107 rotates clockwise by a diagram, a tube 103 will be inserted between the rotation koro 108 and the bend 110 of a case 109 from the arm head 2 side, and actuation which draws a tube 103 through from an arm head 2 side will be performed. Thereby, negative pressure arises in the arm head side of a tube 103, and this serves as an ink suction force.

[0023] The recovery system zero flag 106 is fixed to the side of Rota 107, and the zero of a recovery system (Rota 107) is detected by detecting this flag 106 by the recovery system zero sensor 105 of the equipment internal fixation.

[0024] The motor (not shown) is connected to this pump 102, and ink can be attracted from the arm head 2 in contact with cap 101 by driving this motor.

[0025] Rota 107 is formed to each of two or more arm heads 2 (here four pieces). The schematic diagram which looked at Rota 107 of drawing 2 from the right-hand side of drawing 2 to drawing 3 is shown. As shown in drawing, two or more Rota 107 is arranged on the same axis of rotation at juxtaposition, and has the rotation koro 108 in the same angle-of-rotation location, respectively. On the periphery of Rota 107 which passes the rotation koro 108, the slot 111 which carries out guidance maintenance of the tube 103 is formed.

[0026] In such a configuration, while Rota 107 rotates, the rotation koro 108 moves from a location a to c, and the rotation koro 108 crushes a tube 103, it moves. Thereby, negative pressure occurs in the arm head 2 side of a tube 103.

[0027] The load concerning Rota 107 is changed during 1 rotation of Rota 107. As for a load, near [ from the location a where the rotation koro 108 runs aground in a tube 103 first especially to / the ] near location b is the largest, and from the location b to the location c from which the rotation koro 108 separates from a tube 103 is the large range of a load next. The range from a location c to a location a has a comparatively small load. Fluctuation of this load is remarkable especially when it is the example of drawing 2 by which the rotation koro 108 is formed in the angular position same about all Rota 107.

[0028] Then, as shown in drawing 7 (a), corresponding to the rotation location range of the rotation koro 108, adjustable control of the speed of the motor (not shown) which carries out the rotation drive of Rota 107 of a pump 102 is carried out intentionally. That is, medium speed and the rotation location c to a drives a low speed and the rotation location b to c at

high speed to the rotation location a to b relatively. This enables it to drive the pump 102 of drawing 2 without fault also by the motor with comparatively small power.

[0029] The flow chart with which the procedure of the recovery action of the print head in the gestalt of this operation is expressed to drawing 4 is shown.

[0030] For example, when blinding occurs on an arm head 2, a suction demand occurs with a user's etc. directions (S201). Generating of a suction demand performs recovery system zero detection first (S202). Subsequently, capping is performed (S203) and suction actuation is performed (S204). Then, capping is canceled (S205) and wipe actuation (S206), reserve ****** (S207), and empty suction actuation (S208) are performed. In addition, according to a condition, it may be made to perform a part of such recovery action of various kinds of. For example, what is necessary is to perform only S202 and S208 at the time of empty suction demand generating.

[0031] Actuation of said pump 102 is adopted at the time of suction actuation of step S204, and the empty suction actuation at step 208:00. However, what is necessary is to perform a zero check only before suction actuation, in performing suction actuation and empty suction actuation continuously. In addition, empty suction actuation is actuation which attracts the ink with which the cap 101 was covered by suction actuation or reserve discharging, and is moved to the waste ink tank 104.

[0032] In step S202, gap of the phase excitation by ON/OFF of excitation of a motor can be lost by detecting a recovery system zero, just before performing suction actuation or empty suction actuation.

[0033] Said reserve regurgitation is performed to predetermined timing during printing. In this case, while printing in order to make it not flood from a cap the ink which collected on the cap by reserve discharging under printing after a degree, empty suction actuation is performed and the ink on a cap is attracted into the tube which once leads to a cap from on a cap. And the waste ink accumulated into the tube at the time of printing termination is moved to the waste ink tank 104 by empty suction actuation.

[0034] Under the present circumstances, it is necessary to perform empty suction actuation under printing quickly so that it may not become the hindrance of printing. That is, preferably, as shown in drawing 8 , by empty suction under printing, rotational speed of the rotation koro is made quick compared with the time of ink suction. Moreover, in order to make it empty suction after printing termination not leave waste ink into a tube, it needs to make suction speed slow and makes rotational speed of the rotation koro slow. Or both empty suction speed may be unified into the quicker one. It is desirable to carry out multiple-times (for example, 2 times) continuation, and to perform empty suction at the time of printing termination in that case.

[0035] By the way, it is known that pigment ink generally has high viscosity compared with color ink. Therefore, the motor load for ink suction of the direction which attracts ink from the arm head of pigment ink rather than attracting ink from the arm head of color ink

becomes large. According to it, it may be made to make rotational speed of the rotation koro later than the time of suction of color ink at the time of pigment ink suction. While making the load of a motor light by this, it becomes possible to perform positive ink suction.

[0036] Drawing 5 is the side elevation showing the outline configuration of the recovery system 14 in the gestalt of operation of the 2nd of this invention. A point which is different from the gestalt of the 1st operation with the gestalt of this operation is that the angular position (phase) of the rotation koro 108 of two or more Rota 107 is not in agreement. While making in agreement the phase of the rotation koro in Rota for two or more arm heads other than black ink, specifically, the phase of the rotation koro in Rota for the arm heads of black ink is changed with said phase. In this example, the location of the rotation koro 108 of Rota 107 corresponding to the arm head of black ink is established in the location where about 180 degrees is opposite to the location of the rotation koro 108 of Rota 107 corresponding to the arm head of the ink of other colors. Since the number of the rotation koro 108 which crushes a tube 103 to coincidence is reduced by this, it will decrease compared with the case where the load to Rota 107 is drawing 3 .

[0037] The relation of the rotation location pair rotational speed of the rotation koro 108 in the configuration of drawing 5 is shown in drawing 7 (b). When there is a rotation koro 108 between d from between b and the rotation location c from the rotation location a, he is trying to become a low speed comparatively in this example. considering as a low speed by d from the rotation location c -- the rotation koro 108 of the opposite side -- this range -- a tube 103 -- since it starts crushing -- it is . With the arm head of black ink, and the arm head of other color ink, since the number of arm heads is out of balance, the direction of a group with many rotation koro may distinguish between rotational speed at rotation location range a-b and c-d so that speed may become low. You may distinguish between rotational speed similarly about rotation location range b-c and d-a.

[0038] Moreover, with the gestalt of operation of drawing 5 , it also becomes possible about the arm head of black ink, and the arm head of other color ink to perform suction actuation independently according to an individual. Usually, although only monochrome printing is sometimes often performed continuously, even if the recovery action of the arm head of black ink is needed in this case, the recovery action of other color ink is necessarily unnecessary. In such a case, with the gestalt of this operation, only the arm head of black ink can perform recovery action independently. Thereby, useless ink consumption can be prevented. In connection with this, the length of the bend 108 of the case 109 where a tube 103 is crushed is made into less than 180 degrees shorter than the case of drawing 3 .

[0039] The outline configuration of the recovery system 14 in the gestalt of the operation of the 3rd of this invention to drawing 6 is shown in the last. A point which is different from the gestalt of the 1st and the 2nd operation with the gestalt of this operation is that each angular positions (phase) of the rotation koro 108 of two or more Rota 107 differ. Specifically, the phase of the rotation koro 108 is shifted mostly at equal intervals mutually. In this example,

the location of the rotation koro 108 of Rota 107 corresponding to four arm heads corresponding to the ink of four colors is arranged at intervals of about 90 degrees. Since the number of the rotation koro 108 which crushes a tube 103 to coincidence is reduced by even one piece by this, compared with the case where the load to Rota 107 is drawing 5 , it will decrease further. In connection with this, the length of the bend 108 of the case 109 where a tube 103 is crushed is made into less than 90 degrees still shorter than the case of drawing 5 .

[0040] The relation of the rotation location pair rotational speed of the rotation koro 108 in the configuration of drawing 6 is shown in drawing 7 (c). when there is a rotation koro 108 between each of f and g to h from d and e, he is trying to serve as a low speed from b and c from the rotation location a comparatively in this example

[0041] Moreover, with the gestalt of operation of drawing 6 , it becomes possible about the arm head of each ink to perform suction actuation independently according to an individual. Thereby, the useless ink consumption by recovery action can be prevented.

[0042] In addition, in case ink is attracted, only when the rotation koro of the drawing-in arm head comes to the location which crushes a tube, capping of an arm head can be performed. For this reason, when it becomes possible to perform suction actuation independently according to an individual and Rota rotates the arm head of each ink one time, ink will be attracted from the tube of at least 1 color. Since the rotation load of Rota becomes the heaviest when attracting ink, as shown in drawing 9 , when crushing the tube which attracts ink by the rotation koro, it may be made to make rotational speed of the rotation koro the latest.

[0043] As mentioned above, although the gestalt of suitable operation of this invention was explained, various deformation and modification are possible. For example, although the number of an arm head set to 4, it does not restrict to this.

[0044]

[Effect of the Invention] According to this invention, in the ink jet recording device equipped with the tube pump type recovery system, since a more suitable tube pump type recovery system can be driven, the cost and size of a motor for a pump drive can be reduced.

[0045] Moreover, since suction actuation can be performed according to an individual per 1 or two or more arm heads by making the phase of the rotation koro inharmonious, the useless ink consumption by the recovery system can be prevented.

[0046] Furthermore, gap of the phase excitation by ON/OFF of excitation of a motor can be lost by detecting the zero of a recovery system, just before driving a recovery system. As the result, fear of the step-out by the location gap of a motor which is driving the recovery system can be abolished.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the ink jet recording device concerning the gestalt of operation of this invention.

[Drawing 2] It is the side elevation showing the outline configuration of a recovery system shown in drawing 1 .

[Drawing 3] It is the front view showing the outline configuration which looked at Rota 1 of drawing 2 from the right-hand side of drawing 2 .

[Drawing 4] It is a flow chart showing the procedure of the recovery action of the print head in the gestalt of operation of this invention.

[Drawing 5] It is the side elevation showing the outline configuration of the recovery system in the gestalt of operation of the 2nd of this invention.

[Drawing 6] It is the side elevation showing the outline configuration of the recovery system in the gestalt of operation of the 3rd of this invention.

[Drawing 7] It is drawing in the gestalt of each operation of this invention showing the relation of the rotation location pair rotational speed of the rotation koro.

[Drawing 8] It is drawing showing the modification of the gestalt of operation of the 1st of this invention.

[Drawing 9] It is drawing showing the modification of the gestalt of operation of the 3rd of this invention.

[Description of Notations]

2 Print Head
11 Platen
12 Guide Shaft
13 Carriage
14 Head Recovery System
15 Control Unit
16 Conveyance Roller
101 Cap
102 Pump
103 Tube
104 Waste Ink Tank
105 Zero Sensor
106 Flag
107 Rota
108 Rotation Koro
109 Case
110 Bend
111 Slot